

app. 27

A
DISSERTATION
ON THE
SOURCES
OF

Malignant Bilious, or Yellow Fever,

AND MEANS OF PREVENTING IT;

SUBMITTED TO
THE EXAMINATION
OF THE
REV. JOHN EWING, S. T. P. PROVOST;
THE
TRUSTEES & MEDICAL FACULTY,
OF THE
UNIVERSITY OF PENNSYLVANIA,

On the sixth Day of June, 1799,

FOR THE DEGREE OF
DOCTOR OF MEDICINE.

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MEMBER OF THE PHILADELPHIA MEDICAL AND CHEMICAL SOCIETIES.

PHILADELPHIA:
PRINTED BY WAY & GROFF,
No. 48, North Third-Street.
1799.

99/91

DISEASES
OF
THE
LIVER

Malignant Bilious, or Yellow Fever

AND MEANS OF PREVENTING IT

REGISTERED NO.

THE EXAMINATION

1827

NEW YORK: PRINTED BY T. P. FINE

312812



DOCTOR OF MEDICINE

WITHDRAWN
FROM A. P. S.

TO
PHILIP SYNG PHYSICK, M. D.

THIS DISSERTATION

IS DEDICATED,
AS A TESTIMONY OF THE

SINCERE FRIENDSHIP,

AND GRATITUDE,

OF HIS FORMER PUPIL,

W. G. CHALWILL.

DISSERTATION, &c.

BEFORE we enter on the immediate consideration of the subject of this dissertation, it may not be improper to introduce a few general remarks, which appear necessary, in order to be understood in some opinions which will be delivered therein.

Fever, from whatever cause it may proceed, I conceive to be the same. This can be more clearly comprehended, from the definition given of it, by Dr. Rush, the professor of the institutes of medicine, in the University of Pennsylvania. He defines it to consist of, irregular, morbid, or convulsive action, in the blood-vessels. It is no objection to this definition, that in some fevers, there occurs a defect of action, as this defect is certainly morbid.

There is but one remote cause of fever, and that is stimulus. This we conclude, from many substances, such for instance as opium, spirituous liquors, &c. which are universally acknowledged to be stimulant, and many others, from the animal, vegetable, and mineral kingdoms, by their external

or internal action on the body, producing genuine fever. Like the exhibition of these violent poisons in excessive quantities, in prostrating the system below the point of re-action, the remote causes of malignant epidemic diseases, have produced similar effects, and like them, in some instances, almost immediate death. In the plague, and yellow fever, this has been particularly noticed by different writers. During the prevalence of those diseases, instances have frequently occurred, of persons dying within a very few hours, after having been attacked; and have experienced little or no inconvenience, until a very short time previous to their death.

Having delivered these observations, we shall proceed with our inquiry into the sources of malignant, bilious, or yellow fever.

The opinions, which have been entertained on this, as on every other point, in, and connected with, medicine, have been as various, as plausibility or improbability, could give scope for. The examination of the variety of opinions, which prevail, even at the present day, would far exceed the limits prescribed for a thesis, and could not be attended with any evident advantage.

The generality of physicians, however, agree in supposing, that the effluvia or miasmata, arising

from putrefying animal and vegetable substances, are the cause of this disease. This opinion we shall adopt, in the succeeding pages. It would be proper in this place to speak of the nature of these effluvia, but it will be readily perceived, that on this subject we can say nothing, with certainty, as the present state of science affords us no means, by which we may detect their presence or determine their qualities. It is even a disputed point, whether during the prevalence of epidemics, there is an addition of some peculiar matters, or a deficiency or excess, in the natural component parts of the atmosphere. We can therefore only judge of them, by their effects.

There are, however, three facts which have been noticed, with respect to epidemics, which are worthy of our attention.

I. That the inflammatory constitution of the air, which disposes to them, extends its influence over considerable portions of our globe at one and the same time. While the yellow fever was epidemic, in many parts of the United States, during the years 1793 and 1794, it was at the same time epidemic in most of the West Indian islands. The diseases which occurred at sea, during those years, were observed to assume a higher grade of action. From this we may conclude, that the surface of the ocean itself, was

not exempted from its influence. Thucydides tells us in his account of the plague at Athens, that it prevailed at the same time in part of Ethiopia, in Egypt, in Lybia, and over a considerable extent of the Persian dominions. Procopius and Evagrius tell us that the plague which broke out at Constantinople, during the reign of the Emperor Justinian, lasted fifty-two years, and spread its influence over the whole earth.

II. That it continues many years under every vicissitude of weather.

III. That during its continuance, it causes all other diseases to assume a more inflammatory grade of action, and hence we derive the propriety of saying, *the reigning epidemic*.

In support of the two last mentioned facts, we may assert, that the diseases of the United States, have been uniformly observed to be more violent, since the general epidemic of 1793. This has been evinced by their requiring the respective modes of treatment for curing each of them, to be used more extensively, to prove effectual, than they did previous to that period.

Since, therefore, we know so little of the nature of the causes, or rather miasmata, we must

content ourselves with an investigation of the sources from whence malignant bilious, or yellow fever arises; and in this we can probably proceed, with some degree of certainty.

We shall commence with those sources which operate most extensively, and proceed with those which have been more confined in their influence. The sources which present themselves for our attention, are,

I. Marshy and swampy grounds, stagnating ponds and low lands, which have been overflowed with water, and in which have been deposited, substances proper for putrefaction, from the influence of the heat of the sun. To prove that these sources do produce the causes of yellow fever, it is only necessary that we should attend to a few well authenticated facts.

It is a remark, sanctioned by universal experience, that low countries and lowland situations, are always unhealthy, provided they abound with marshes. Dr. Lind, among his signs of an unhealthy country, places a swampy soil as the first, and most certain.

The province of Guiana, remarkable for its low situation and swampy soil, continued to prove a

grave to those who went to settle there, until means were taken to render it healthy, which will be mentioned hereafter.

It may not be improper to remark in this place, that a certain concentration of the marsh miasmata, appears necessary, to produce yellow fever. Where this concentration does not take place, the effluvia produce fevers of an inferior grade. We conclude this, from the higher and lower grades of fever, proving alternately epidemic in the same situations; the higher grade prevailing in those seasons, most favourable for a copious evolution of the miasmata.

The circumstances under which the yellow fever has appeared in many inland parts of the United States, afford us ample proof of its originating from the effluvia of marshes; and as such facts are more interesting to us at present, we shall confine ourselves to them.

As it is directly to our purpose, I must here take the liberty of transcribing a document *, from among those accompanying two letters addressed to the governor of Pennsylvania, by the academy of medicine of Philadelphia.

* See appendix to those letters, (Document C.)

“I do hereby certify, that I visited the farms at and in the vicinity of Red-bank, situate on the eastern shore of the Delaware, for the purpose of investigating the origin of the yellow fever, that raged so violently amongst them, during the late autumn. I sought every possible information from the attending physician, the families who had been attacked, and from their neighbours. Knowing that a disease of this kind might have been derived from domestic sources, from the city of Philadelphia, and, possibly, from the shipping performing quarantine, I was exceedingly particular upon these points of enquiry and investigation. After examining the documents upon this subject, I do not hesitate to pronounce it the offspring of local causes.

“The most valuable part of these farms consists in meadows, which had been overflowed, for ten or twelve days, by a deluge of rain that commenced on the first of August. The waters gradually disappeared, and deposited a scum that was exceedingly nauseous. The roots of the grass were dead in many places for an acre or more in extent; even six inches below the surface of the earth they were destroyed—the vegetable putrefaction was great, and the smell arising from it extremely disagreeable. To this source I attribute the disease that prevailed amongst them. Twenty-nine persons were attacked in five families; but so local was the calamity, that,

although the neighbours kept up a constant communication, by visiting the sick rooms, and rendering their services, no person, that these families recollect, was affected with it, in consequence. And there is but one possible case in which it could have been communicated, by any one of these families to any of the others.

“ My opinion of the local origin of the yellow fever, derives support from its being the idea of the physician who attended the sick, and the universal sentiment of those who have suffered by it. Documents, entering into detail, to establish these, and a variety of other points connected with the disease, are subscribed by all the persons alluded to, and deposited among the records of the academy of medicine.

Signed, JOHN C. OTTO.

March 20th, 1798.”

At Sheffield, in the state of Massachusetts, a violent bilious fever has prevailed, several successive years, which appears to have had a strong alliance to yellow fever, from the account given of it by Dr. Buel. In this account, the author, after stating his facts, relative to the disease, has the following words: “ That the stagnant waters in Sheffield, and the sickness which prevailed there in 1796, and the other late sickly years, stand in the relation of

cause and effect, is, I think, a position which no person capable of reasoning, can withhold his assent to, after admitting, and candidly considering, the facts which I have stated."

In the village of Kensington, about two miles distant from the city of Philadelphia, several cases of yellow fever occurred, in the autumn of 1797, which appear to have been derived from marsh effluvia. This little place is surrounded on all sides by marshy grounds, which are filled with putrefying, dead vegetable substances.

At Lamberton, on the eastern bank of the river Delaware, near Trenton, several cases of yellow fever occurred, in the autumn of 1798. The inhabitants endeavoured to trace them from contagion, conveyed by persons from Philadelphia. Having had an opportunity of examining whether any foundation existed for such a supposition, I found none. But on investigation, there appeared evident reason for believing, that they were produced by a considerable extent of marshy ground, containing a great deal of stagnating water, and putrefying vegetable substances, that lay in a southern direction from Lamberton, distant about a quarter of a mile.

That portion of land, situate at the conflux of

the rivers Delaware and Schuylkill, known by the name of the neck, containing a large tract of marshy ground, affords us a very good proof of the origin of violent bilious fever from exhalation. Scarce an autumn passes, but what numbers of the inhabitants are affected with fevers, shewing strong marks of an approach to the malignant type.

II. From putrefying animal and vegetable substances deposited in gutters, filthy alleys, in docks, on wharves, in public sinks, &c.

We have too much reason to suppose, that these were the principal sources, of the yellow fever, which has, at different times, desolated the cities of Philadelphia and New York. That these sources have operated very strongly in producing the disease, we infer from the observations of many respectable physicians, all of which agree, that in the vicinity of such places, as above enumerated, the fever began, and raged with more violence, than, in those situations, which were remote from their direct influence. Several cases, derived from these sources, are mentioned in the first letter of the academy of medicine of Philadelphia, addressed to the governor of Pennsylvania, on the authorities of Doctors Rush, Physick, Caldwell, and Pascalis.

Dr. Seaman, in his ingenious inquiry into the

cause of the prevalence of the yellow fever in New York, published in the medical repository, has given pretty decided proof, of its originating from these sources. As certain parts of this inquiry are directly to our purpose, I hope I shall be excused for transcribing those which are the most interesting.

“ In the autumn of 1791, the yellow fever was considerably prevalent in a part of Water-street, in the neighbourhood of Peck’s-slip, noted, at that time, for having the docks near to it, loaded with every kind of filth that could be scraped up out of the adjoining slips, which had been long collecting every species of corruptible materials, that the citizens wished to get rid of.

“ In 1795, that part of the town, that bore the chief burthen of our calamity, was remarkably distinguished, by peculiarity of circumstances and situation (aided by the singular regularity of our rains), seemingly well calculated for the accumulation and decomposition of all kinds of perishable animal and vegetable substances.

“ The chief prevalence of the disease, in 1796, seemed evidently fixed, where, from our former experience, we ought reasonably to have expected it. For no doubt, at that time, the neighbourhood of the Whitehall, from the nature of materials,

wherewith a large dock was there filling up, aided by the noisome exhalations, from the exposed bottom of the Exchange-ship at low-water, must certainly have been rendered the most noxious part of the city. Four deaths from the yellow fever occurred, during that season, within fifty yards of where Roosevelt-street drain empties itself into an inlet, which was then open quite up to the southerly side of Water-street; the bottom of which was frequently, in part, left bare, even at high water. Every ebb-tide exposed, at least, eight hundred square yards of its surface, covered with the numerous perishable materials, furnished by the different streets, of that crowded part of the town, which descend into this common sewer, in addition to the other putrid matters, that such handy places are always collecting."

The yellow fever was generated in the year 1762, near the draw bridge, in Philadelphia, by the noxious effluvia, arising from putrescent matters, collected from all parts of the city, in a well known receptacle, at that place.

The following communication, from Dr. George Davidson, of the island of St. Vincents, to Dr. Rush, decidedly shews, the origin of yellow fever, to be from the effluvia discharged from putrefying animal and vegetable substances.

“ The yellow fever is evidently produced by a peculiar state of the air, and by marsh exhalations. The situation of those habitations where it first appears, near to stagnant water, or swamps, point out this to be its origin. The governor’s guard on this island was stationed in an old bathing house. The stream of water which had run through it, had been diverted from it ; but a quantity of mud and filth, had been allowed to accumulate in a watering trough near the door ; in consequence of which, several of the guards were seized with the usual symptoms of yellow fever. Above ten died before the cause was discovered, and immediately upon removing it (the filth collected in the watering trough) the guard became healthy.”

Many sources of inferior note, have at different times given rise to malignant fever, the most important of which we shall now proceed to mention.

1. The noxious air discharged from putrefying animal and vegetable substances, contained in the holds of ships. A considerable source of the yellow fever, which raged in the south-eastern part of Philadelphia, in the year 1797, was attributed to the foul air emitted from the snow Huldah, from Hamburgh, and ship Navigation from Marseilles, from some of the materials which composed their

cargoes, putrefying in their holds, during their voyages.

The crews of these vessels continued healthy, from their leaving the ports from whence they came until they discharged their cargoes, at the wharves in this city, when several of their crews, and many residents near those wharves were immediately seized with the fever.

At Tortola, a fever was produced in the month of June, in the year 1787, on board the ship *Britannia*, Capt. James Welch, from the noxious air generated from a few bushels of potatoes, which destroyed the captain, mate, and most of the crew, in a few days.

Two failors were affected with a malignant fever on board the ship —, Capt. Thomas Edgar, in the month of March, 1797, from the noxious air produced by wine that had putrefied in the hold of the ship, one of whom died, soon after her arrival at Philadelphia.

In the month of June, 1793, the yellow fever was generated by the noxious air, emanating from some rotted bags of pepper, on board a French Indiaman, which was carried in the port of Bridgetown in Barbadoes, by the British letter of marque *Pil-*

grim. All the white, and most of the black men employed to remove this pepper, perished with yellow fever, and the foul air affected the town, where it destroyed numbers of the inhabitants.

A yellow fever was produced on board the *Bushbridge* Indiaman, on her passage from England to Madras, in the month of May, 1792, which affected above two hundred of her crew, by putrefying materials confined in her hold.

Instances of yellow fever, originating from tropical sources, have occurred in every country and situation. As they tend to prove that the disease is produced by the effluvia, of animal and vegetable substances, during their decomposition, I shall briefly enumerate them, as mentioned by such authors, as I have perused for information, on this subject.

1. Cabbage. 2. Potatoes. 3. Pepper. 4. Indian meal. 5. Onions. 6. Mint. 7. Anise and caraway seed confined in the hold of a ship.

8. Putrefying coffee. The first cases of yellow fever which occurred in the month of August, in the year 1793, in this city, arose from this source.

Dr. Trotter mentions, on the authority of the

captain of a man of war, that the whole crews of several vessels, in the holds of which, great quantities of this article had been allowed to putrefy, were found dead on their decks, from the immediate action of air discharged on opening their hatches.

9. Cotton that had been wetted on board of a vessel, that arrived a few years ago from Savannah, in Georgia, at New York.

10. Hemp, flax, and straw.

Dr. Zimmerman relates the fact, of a family that were affected with a malignant fever, generated by a few pounds of putrefying flax,

11. The canvass of an old tent.

12. Old books, and old paper money, that had been wetted and confined in close rooms and closets.

13. The timber of an old house.

14. Green wood confined in a close cellar, during the summer months.

15. The green timber of a new ship.

16. The stagnating air of the hold of a ship.

17. Bilge water.

18. The stagnating air of close cellars.

19. Air emitted by agitating foul and stagnating water.

20. A duck-pond.

21. A Hog-stye.

All these different sources have been mentioned by authors as having given rise to malignant fevers.

Animal substances, I believe, seldom produce this grade of fever, when acting alone, although the following facts, shew that it has been in a few instances produced from this source.

1. Dr. Osborne has (through the medium of the New York medical repository) communicated the case of a soldier, who had a malignant fever brought on by the miasmata arising from putrefying beef.

2. Locusts.

3. A whale thrown on the sea shore in Holland.

4. Human bodies which have putrefied on a field of battle.

5. Raw hides confined in stores and in the hold of a ship.

6. Dead fish putrefying on the shores of the sea and of rivers:

The unhealthiness of a place called Gambroon, mentioned by Mr. Ives in his travels from India to Europe, over land, is imputed to the quantities of blubber fish, left annually, during the summer months, by the sea upon the shore, which very soon become highly putrid, and offensive.

The same gentleman tells us, that the Arabs, as a resentment for the injuries they had sustained from the Turks of Bassora, broke down the banks of the river Tigris, which overflowed the environs of that great city, and from the deposition of dead fish, a malignant fever was produced which destroyed 14,000 of its inhabitants.

These facts, we hope are sufficient to prove, that the malignant yellow fever, is the offspring of animal and vegetable putrefaction,

The influence of the extremes of heat and cold, on the causes of this disease, are pretty nearly the same, for they both destroy them. This is to be admitted with proper limitations. Cold weather

does it effectually, and excessive hot weather in some degree. Moisture, heat, and dryness of the atmosphere, alternating with each other, appear to be most favourable for their formation, and a chilliness in the air succeeding these, the most effectual means, of bringing them into action. This suggests to us the propriety of accommodating our dress to the changes of the atmosphere, to prevent the miasmata from acting on our systems ; the change from a higher, to a lower temperature of air, rendering them more susceptible of morbid actions, from an increase of excitability.

There are many other stimuli, which, by their action on the body, produce most of the symptoms of malignant fever. To examine all of them would far exceed the limits of this dissertation. We may however just enumerate some of them.

1. Opium.
2. Poison of a mad dog.
3. The poison of the viper.
4. Variolus infection.
5. Many poisonous vegetables.
6. Hydrogene gas. This fluid has been long

considered inert, and depriving animals of life, merely by a negative action, in preventing the access of oxygenous gas to their lungs. Dr. Woodhouse having inhaled a considerable quantity of this air, to convince the medical class of its innocence, was in consequence of it, seized with a highly inflammatory fever, which yielded only to copious depletion.

7. The poisons of certain spiders, and of the scorpion.

8. Arsenic.

9. Certain concentrated mineral acids, and metallic salts, taken into the stomach in large quantities.

10. The action of fire.

From the view we have taken, of the sources of malignant yellow fever, it is evident, they may exist in any part of the world. This being admitted, it necessarily follows, that it is the height of absurdity, to assign it exclusively to any place. This erroneous idea, must have taken its rise, from the disease being more frequently prevalent in certain countries, favoured by the states of air, most proper for the evolution of marsh miasmata.

The causes of yellow fever operate in a variety of ways, producing,

1. **Dysentery.** As an instance of this, we may just mention the Duke of Brunswick's army, in entering the French dominions, in the autumn of 1792. This great army, consisting of near 100,000 men, being arrested in their progress on the marshy plains of Champagne, were obliged, from the prevalence of this disease among them, to retreat, in less than two months.

2. **Hepatitis.**

3. **Colic.**

4. **Colera.**

5. **Cutaneous eruptions.**

6. **Leprosy.**

7. **Scurvy.** Dr. Claiborne, in his inaugural thesis, last year, on the scurvy, does not hesitate to place marsh effluvia, the first on his list of the remote causes of this disease.

8. **Ophthalmia.**

Having finished our inquiry into the sources, we shall proceed to the next part of this dissertation, viz.

MEANS OF PREVENTION.

This may with propriety be divided into two parts.

1. As it respects the causes, and 2dly, as it respects the body.

As we considered marshy grounds, &c. first, when treating of the sources, we shall treat of them first in this place.

The only plan we can recommend to prevent these extensive sources of yellow fever, is to cultivate such grounds, where it is practicable. All countries have been observed to enjoy a greater degree of health, in proportion to cultivation.—Where this cannot be practised, draining by means of canals, has proved very effectual.

The now fertile province of Demarara, at one time almost uninhabitable from its unhealthiness, has by this means been rendered as healthy as most tropical countries.

If marshy grounds or filthy stagnating ponds, cannot be cultivated or drained, we recommend the planting of trees around them. They may act in two ways, 1. By mechanically diffusing the mias-

mata through the atmosphere, and thereby preventing a sufficient concentration of them to produce disease, and 2dly, By giving out a large portion of oxygenous gaz, and thereby purifying the vitiated atmospheric air. The willow tree appears best calculated for this purpose, as being quickest in growth, and yielding a greater quantity of pure air.

With respect to putrefying animal and vegetable substances, collected from negligence, we can do nothing more than recommend their removal. It would be worthy the investigation of some ingenious person, to form a plan, for doing this with œconomy, as the expence attending their removal, would be far too great, to have it done properly. It is probable this might be done, by establishing a plan for the formation of artificial nitre beds from these materials, that would repay the expence of removing them, by the nitre, which they would produce.

This may also be done by means of water. To be effectual, it ought to be furnished in sufficiency, to deluge the streets, whenever occasion may require. Or it may be done by passing a canal of water through the streets, and sweeping the substances in a state of putrefaction into it, that may be conveyed to the river into which the canal may empty itself.

The establishment of quarantine laws, and of lazarettoes would effectually prevent the production of yellow fever from the damaged cargoes of vessels.

Two methods have been found useful in destroying the miasmata.

1. By nitrous fumigations. This has been highly recommended by Dr. Carmichael Smyth, and is now generally adopted throughout the British Navy, where it has been found very effectual.

2. Smoke. Dr. Lind, in his essay on the diseases incident to Europeans in hot climates, relates the fact of two men of war which were cruising in company, on the coast of Guinea, on board of one, the crew were very sickly, and many died, the crew of the other remained perfectly healthy. Upon examination, it appeared from the construction of these different ships, that in the one, which had the healthy crew, the smoke of the cook's room used to spread itself over the whole ship's decks, and between them; while in the other, it flew directly off from the vessel, with the wind.

The means of prevention as they respect the body, are,

1. By reducing the system as in preparing the

body for the small pox. This may be done, 1. By a vegetable diet, or a diet of salt meat, which affords less nutrition than fresh, at the same time that it keeps up a more uniform degree of excitement.

2. By blood-letting. 3. Purges.

The following fact will shew the good effects of this plan of prevention, communicated by Dr. Borland to Dr. Rush.

In the month of August, 1797, 109 Dutch artilleryists arrived at Port-au-Prince, in the Bangalore transport. The crew of this ship consisted of twenty-eight men. It was advised by Doctors Borland and Jackson, that the whole detachment should be bled and purged freely. The surgeon of the regiment, to which this company belonged, complied with their advice, which was accordingly executed. At the period of four months after, when this communication was made, only two men out of this detachment had died ; of the crew only fourteen were living.

2. By eating often, even during the night, which by keeping up an equal degree of excitement, will render the system less liable to be acted on, from predisposing debility.

3. Cleanliness.

4. Warm bath.

5. Cheerful society.

6. Constant occupation of mind and body. People, who were left in Philadelphia, to take care of houses, during the prevalence of the yellow fever, and who were idle, were very liable to be affected by it.

7. Gentle exercise.

8. The internal and external use of sweet oil. Mr. Baldwin the English consul at Alexandria, informed Leopold count Berchtold, that he never heard of a single oil porter having died with the plague. From this the count concluded, that olive oil must possess strong prophylactic virtues. He tried it in twenty-two Venetian sailors, all of which escaped the plague. From this we may rationally infer, that its effects would be similar in the yellow fever.

9. A blister. Dr. Gallagher informed me, that during the prevalence of the yellow fever, in Philadelphia, last year, he applied blisters to his wrists, which he kept continually running, and to this ascribes his escaping the disease.

10. An issue. Dr. Hodges tells us, that during the plague in London, he had a featon in one of his legs, which gave him great pain every time he was exposed to the contagion in visiting his patients. It is probable that the pain was caused by a determination of morbid action to this artificial weak part.

It is an unfortunate truth, that the generality of mankind are blind to conviction, wherever truth and interest oppose each other. In yellow fever this is particularly the case. Notwithstanding the numerous, decided proofs, brought forward by men and literary bodies, of the first eminence, of the domestic origin of this disease, yet there are not wanting many who believe, it owes its origin to importation. But as the present progressive and diffusive state of science, is highly unfavourable to the continuance of error; the friends of truth, must look forward to a period, which I hope is not far distant, when, from the general adoption of their principles, the inhabitants of sickly cities, and country situations, will, by their exertions, prevent the recurrence of these diseases, by a removal of their causes.

F I N I S.

